Ward calls not so scary for medical students after interprofessional simulation course: a mixed-methods cohort evaluation study

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ABSTRACT

Background An interprofessional simulation 'ward call' course—WardSim—was designed and implemented for medical, pharmacy and nursing students. We evaluated this intervention and also explored students' experiences and ideas of both the course and of ward calls.

Methods We used a mixed-methods cohort study design including survey and focus groups. Descriptive statistical analysis and general purpose thematic analysis were undertaken.

Results Survey respondents who participated in WardSim subsequently attended more ward calls and took a more active role than the control cohort, with 34% of the intervention cohort attending ward calls under indirect supervision, compared with 15% from the control cohort (P=0.004). Focus group participants indicated that the situation they were most anxious about facing in the future was attending a ward call. They reported that their collective experiences on WardSim alleviated such anxiety because it offered them experiential learning that they could then apply in real-life situations. They said they had learnt how to work effectively with other team members, to take on a leadership role, to make differential diagnoses under pressure and to effectively communicate and seek help.

Conclusions An interprofessional, simulated ward call course increased medical students' sense of preparedness for and participation in ward calls in the next calendar year.

BACKGROUND

Medical students may feel daunted, anxious and unprepared for the transition to their first year of practice as a junior doctor.[1 2] Previous clinical experience of ward calls, the extent to which their clinical supervisors encouraged participation and their exposure to working in interprofessional teams may play a part.[3 4] Brennan *et al*[1] concluded that 'early, meaningful, sustained and carefully structured patient contact …will support a better experience of the transition' from medical student to practising doctor.

Sheehan *et al*[5] note that such contact with supervisors and interprofessional peers is also critical to shaping junior doctor learning and development during this transition. Their article, which concerns the components of apprenticeship learning, provides the theoretical underpinnings of this study.[5] Sheehan *et al* describe four key elements of the 'good apprentice': 'engagement; managing uncertainty in decision making; learning from practice and maximizing feedback; and adopting an ethical and moral commitment to patient safety' (5, p 90). A specific area of medical practice where the capabilities of the student/junior doctor (apprentice) become apparent is the after-hours 'ward call'—the call from a nurse to review a patient on the ward with a change in his or her condition.[6]

Ward calls are of particular concern to junior doctors. The signs may be difficult to interpret, the diagnosis uncertain and the patient potentially at risk. While widely acknowledged as a problem,[7] timely recognition and response to the deteriorating hospitalised patient has traditionally received little space in the formal undergraduate curriculum. To respond effectively, safely and efficiently to ward calls, junior doctors must be able to make a good assessment of the situation and where it may be heading, make logical clinical decisions under pressure, communicate with colleagues and prioritise tasks.[4] Simulation-based learning may provide students with a structured orientation to ward calls. Brennan *et al*[1] suggest that working in a multidisciplinary team, students can take responsibility for the assessment and initial management of a patient in a simulated ward call, an experience likely to promote better recall and learning than simply observing, or attending a lecture.

Ward-based work is dependent on good interprofessional teamwork of an often relatively junior healthcare team who may not have the knowledge, skills or attitudes, or the organisational support, to work effectively together.[8] Safe, efficient and effective interprofessional care can be compromised by misunderstanding and poor communication and this can ultimately affect patient outcomes.[9] As Salas notes, healthcare is a team enterprise and should be practised as such.[10]

At the University of Auckland, the medical programme duration is six years. Year Six, also known as the trainee intern year, is largely a year of preparation for the first year of practice as a junior doctor.[11] During the trainee intern year students join clinical teams and perform intern ward work under close supervision. Observing and participating in ward calls is encouraged but uptake of these important learning opportunities is not monitored and anecdotally is low.

The medical programme is situated in the Faculty of Medical and Health Sciences which also has a School of Nursing and a School of Pharmacy. Prior to 2014, students from the three professional

groups had several mandatory interprofessional learning (IPL) courses during their programmes: a 2-day course on quality and safety in healthcare, Māori Health Week and interprofessional advanced life support training. WardSim was added to the IPL offerings in 2014. A multidisciplinary group of clinical educators developed this 2-day interprofessional simulation-based course (WardSim) and piloted it in 2013 with a small group of students. In 2014, it became mandatory for all Year Five medical students, Year Four pharmacy students and Year Three nursing students in our Faculty. In this study, we set out to evaluate the WardSim in terms of its medium-term effect on medical students in their subsequent trainee intern year (9–16 months after attending WardSim). We also explored students' experiences and ideas of both the course and ward calls.

We asked three research questions:

1. Does WardSim increase trainee intern self-reported active participation in ward calls?
2. Does WardSim increase trainee intern confidence in participating in ward calls?
3. In what ways does WardSim influence trainee interns' attitudes towards interprofessional practice and behaviours in interprofessional teams?

Due to the complexity of this study and richness of data the experiences of nursing and pharmacy students will be presented elsewhere.[12]

Description of the intervention: WardSim

WardSim course objectives

The overall goal was to practise assessing and managing acute inpatient problems using effective communication, leadership and teamwork skills. Specific objectives for all students were a systematic approach to problem solving or raising concerns, role clarity, recognition of knowledge gaps, requesting help using the ISBAR (identification, situation, background, assessment, recommendation/request) structure[13] and speaking up with concerns.

Structure

Students were allocated to mixed professional groups of 8–11 members which were maintained throughout the course. Groups rotated through eight different simulated scenarios and debriefs and eight different classroom-based activities. Each medical student was directly involved in at least one scenario per day, and was an observer when not directly involved.

Educators

Faculty members were drawn from the medical, nursing and pharmacy programmes. Each member had an interest in education and prior to WardSim undertook a half-day formal training session in scenario-based learning including debriefing. The typical ratio of faculty to students was 1:5 and of simulation technical staff to students 1:20.

Eight scenarios

Medical students were asked to take the role of a trainee intern, student nurses were asked to act as new graduate nurses and pharmacy students were asked to act as intern pharmacists.

Immersive scenarios ran for 30 min. Each followed a sequence of nurse and pharmacy (students) briefing, nurse and/or pharmacy (students) attendance as first responder, request for medical help, medical student attendance, collaborative assessment and initial management undertaken, phone call to senior medical staff. Each scenario was followed by a 20–30 minute structured debrief facilitated by one to two faculty (see online supplementary appendix A).

Eight classroom-based activities

These were 30 minute interactive small group exercises designed to complement the scenarios. Topics included structured handover,[13] task prioritisation and graded assertiveness (see online supplementary appendix A).

METHODS

We chose a mixed-methods convergent parallel study design, separately collecting and analysing quantitative questionnaire data and qualitative interview data prior to comparison of data from the two streams, and discussion of convergence or divergence.[14]

Our participants were two cohorts of trainee interns: our control cohort were the 2014 trainee interns who were in Year Five in 2013, prior to the introduction of WardSim. Our intervention cohort were the 2015 trainee interns, who had attended the compulsory WardSim course in 2014 as Year Five students

We administered an online questionnaire in mid-2014 to the control group of trainee interns who had not attended WardSim, and administered the same questionnaire in mid-2015 to the intervention group of trainee interns. We ran three focus groups for 2015 trainee interns to explore the same topics in more depth and included additional questions about the WardSim course.

Ethics

The return of completed questionnaires was taken to indicate respondent consent to participate in the study. All focus group study participants provided verbal consent prior to their participation and written consent either prior to or immediately following their participation. Participants in focus groups were informed they could withdraw from the study at any point during the focus group. They were also informed that they could withdraw from the study up to 2 weeks following the focus group. If participants withdrew we planned to remove their comments from the transcript.

Participants

After a pilot course in 2013, the 2-day WardSim course ran for seven cycles in 2014 to accommodate all Year Five medical students and all Year Three (final year) nursing students at the University of Auckland. All Year Four (final year) pharmacy students participated on day two of WardSim. In 2014 between February and September, all 385 enrolled undergraduates participated in WardSim of which 196 were Year Five medical students.

Data collection

Questionnaire

We designed the online questionnaire to capture trainee intern ideas and practices concerning ward calls. A 7-point Likert scale was used to measure self-reported confidence in managing two clinical vignettes. One vignette described a patient fall very similar to a WardSim scenario, and one vignette presented a postoperative complication not addressed in WardSim.

Questions also sought information on how many ward calls the trainee intern had attended and the extent of their active participation as well as the level of supervision they had received during ward calls. There were three categories: as a passive observer, as an active participant reviewing the patient while being directly observed by the supervising clinician (house officer, registrar, consultant), or as an active participant reviewing the patient without being directly observed and reporting back to the supervising clinician.

In June 2014, all 194 enrolled trainee interns (control cohort) were asked to complete the questionnaire. The request was via email and via the student intranet from medical school administrative staff. A reminder was sent approximately six weeks later. A 'Ward Call' learning package was included as an incentive for students to complete the questionnaire.

In June 2015, all 197 enrolled trainee interns (intervention cohort) were asked to complete the same questionnaire, by the same route and with the same incentive, with a six-week reminder.

Focus groups

In 2015, trainee interns were invited via email to participate in focus group discussions concerning their experience of WardSim and their thoughts about becoming a junior doctor in the near future. Semistructured focus groups were facilitated by two of the authors who were not directly involved with delivery of WardSim in 2014. A semistructured focus group discussion guide was developed following the research questions outlined above (see online supplementary appendix B). Focus groups were audio-recorded and transcribed verbatim.

DATA ANALYSIS

Questionnaire

All statistical data analyses were performed using PASW Statistics for Windows V.18.0 (SPSS, IBM, Chicago, IL). Descriptive statistics were used to summarise participant demographics and responses. Comparison analysis of participant responses by cohort (2014 control cohort versus 2015 intervention cohort) was performed using non-parametric tests (Mann-Whitney U test) for interval data. Statistical significance throughout the study was defined as a P value <0.05.

Focus groups

Following Morse and Field[15] and Saldaña,[16] we used general purpose interpretive thematic analysis in QSR NVivo V.10 software (QSR International; 2012).

Two members of the research team (TJ and TWY) looked for recurrent words, phrases, concepts or themes—which we termed 'codes'—within the data. An initial coding scheme was developed iteratively containing codes, subsidiary codes and their definitions. There was a defined protocol for when to code the concepts. As the analysis progressed, some of the codes and subcodes and their definitions were modified to ensure they conveyed the meaning participants had expressed in the focus groups. Assumptions about the relationships within and between concepts were proposed and explored.

The codes were iteratively formed into themes and subthemes (table 1). These themes were manually cross-checked for reliability and consistency. The QSR NVivo query functions were used to confirm relationships between themes and subthemes. These themes were discussed between the whole research team and refined.

RESULTS

Questionnaire

Of the 194 trainee interns in 2014 (control cohort), 87 completed the questionnaire (45% response rate). Four respondents (4.6%) indicated they had attended the pilot WardSim 2013. Of the 197 trainee interns in 2015 (intervention cohort), 77 completed the questionnaire (39% response rate). These respondents had participated in WardSim in the previous calendar year (9–16 months earlier dependent on which cycle they had attended in 2014).

Table 1 Key themes and subthemes

Theme	Subtheme
Transitions to junior doctor and preparedness	i. Feeling unprepared for attending ward calls (worried, scared, aware of knowledge deficit) ii. Transition process iii. Increasing confidence iv. Becoming safe clinicians v. Expectations around calling for help
Experiential learning through WardSim	i. Observer versus active participant (opportunities to practise) ii. Building skills iii. Calling for help iv. Feeling safe and supported to practise with 'that safety net'
Value of the interprofessional team	i. Collective skills

Female respondents made up 47% and 58% of the control and intervention cohorts, respectively.

A total of 231 responses were received from the intervention cohort regarding self-reported frequency of attendance at ward calls (100% response rate to all three categories of participation). A total of 261 were received from the control cohort (100% response rate to all three categories of participation). Comparison analysis of total frequency of ward call attendances found statistically significant differences between the cohorts in terms of the categories of their participation ($P=0.005$) (see figure 1).

When the type of participation was compared, the intervention cohort respondents reported a significantly higher frequency of attending ward calls under direct supervision than control cohort respondents ($P=0.001$) (see figure 2). Of the intervention cohort respondents, 28 (36%) reported having attended three to four ward calls under direct supervision versus 19 (22%) in the control cohort. In the intervention cohort, 19 (25%) reported having attended five or more ward calls versus six (7%) in the intervention cohort ($P=0.001$).

Respondents from the intervention cohort also reported a significantly higher frequency of attending ward calls without direct observation than the control cohort respondents ($P=0.004$) (see figure 3). Of the intervention cohort, 26 respondents (34%) reported that they had attended five or more ward calls versus 13 respondents (15%) of control cohort.

Self-reported confidence managing the ward calls described in clinical vignettes was also significantly higher in the intervention cohort than the control cohort (see figure 4 and 5).

Focus group findings

Twenty-eight trainee interns in the intervention cohort participated in three focus groups and none opted out of the study during or following the focus groups. All focus group participants voiced strongly positive experiences and views about the value of their learning experiences with WardSim to their clinical practice. Three key themes were identified from their reflections on WardSim: transitions and preparedness; experiential learning; and the value of interprofessional teams. These key themes and their subthemes are outlined in table 1 and explored in more detail below.

Transition to junior doctor and preparedness

Feeling unprepared for attending ward calls (worried, scared, aware of knowledge deficit)

Focus group participants reported feeling daunted, worried and anxious about their upcoming transition to junior doctor.

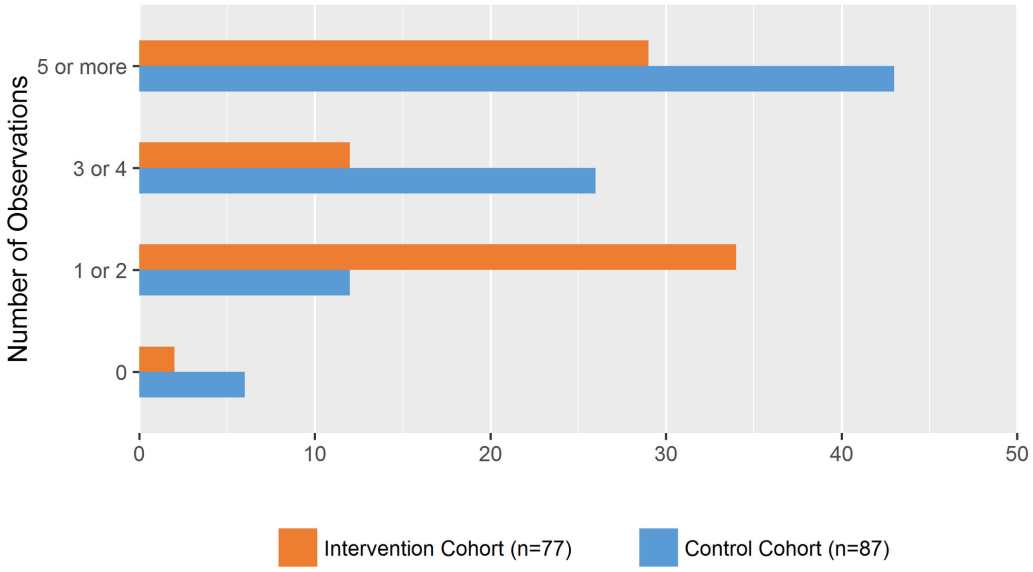

Figure 1 Frequency of self-reported attendance at ward calls as an observer.

They described being most worried about attending the first night shift, being the first point of call, attending ward calls, not meeting expectations, having knowledge deficits leading to errors and patient compromise, and not being able to convert theoretical knowledge to the practical task of patient assessment and management.

> I feel like no time being a student is going to prepare us.
> In my opinion ward calls are the scariest part of our becoming a junior doctor.
> I suppose the biggest worry for me is… missing a bit, like you know about it but you just don't think about it. There is a big list of differentials there that you need to consider and keep in mind.
> I am worried about having to ask a question about something that I blatantly should know and then [supervisor] being like, 'what have you learnt at medical school, why are you asking this?'
> You might know the causes of anuria but it doesn't mean you know how to approach it.

They said while their worries were ongoing, WardSim had increased their sense of preparedness for attending real-life ward calls as junior doctors, and they therefore greatly valued the course.

Transition process

The process of transitioning from medical students to junior doctors was described as somewhat abrupt and haphazard. The sudden transition to junior doctor contributed to the participants' fears/concerns/worries and also to their sense of preparedness to attend ward calls and practise safely.

> You learn the hard way a little bit. … You figure it out on the fly and get your phone out.

Increasing confidence

WardSim was seen by participants as an important opportunity to learn about and experience ward calls, which was not covered elsewhere in their medical curriculum.

> I think in general ward calls are under-emphasized in training when you think about the role that a first year house officer [junior doc-

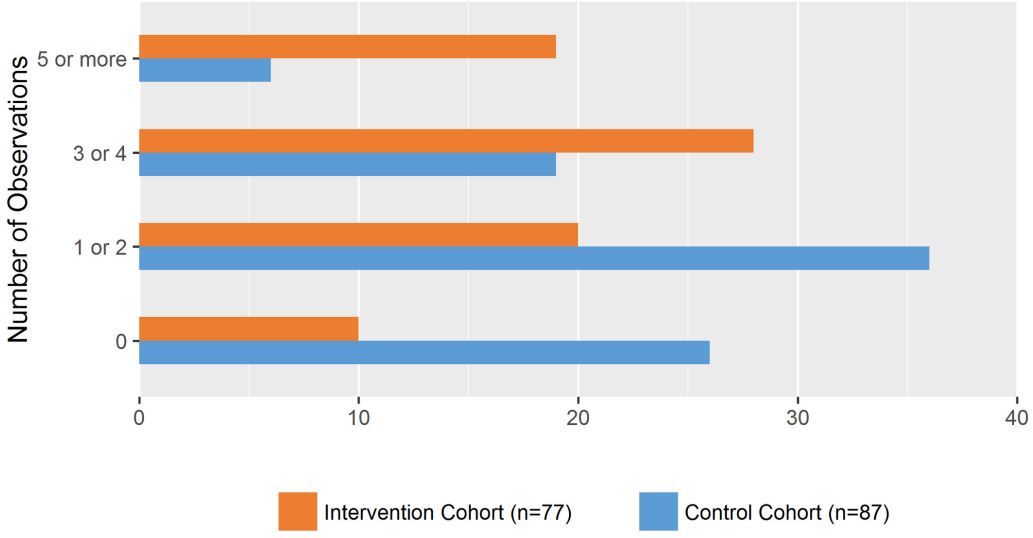

Figure 2 Frequency of self-reported attendance at ward calls as an observer: reviewed patient while being directly observed by supervising clinician.

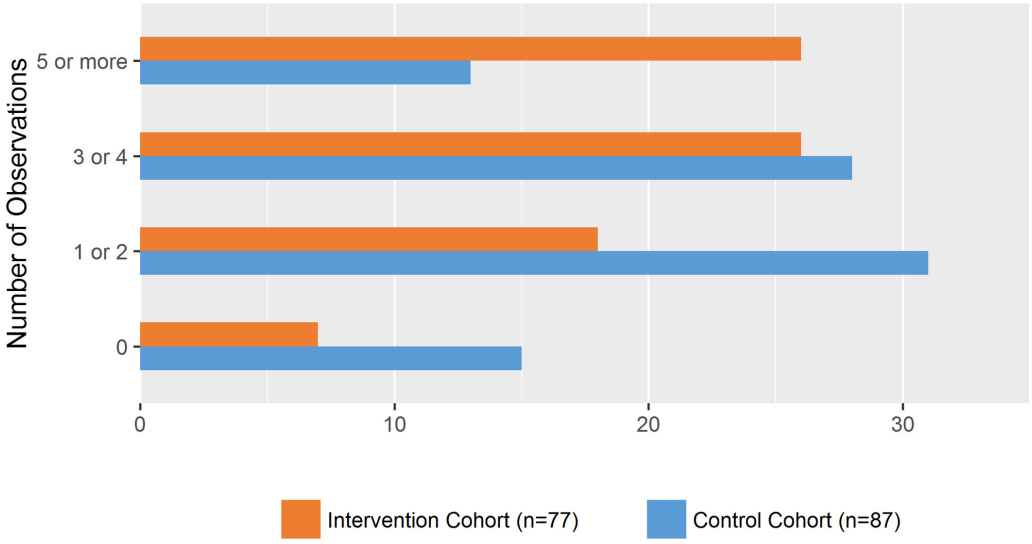

Figure 3 Frequency of self-reported attendance at ward calls as an observer: reviewed patient without being directly observed and reported back to the supervising clinician.

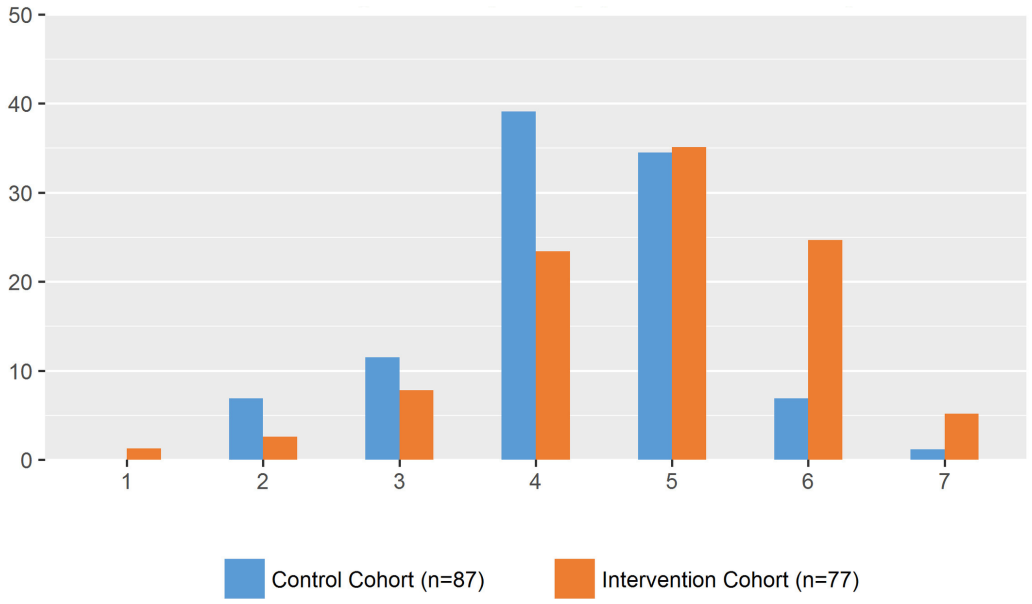

Figure 4 Level of confidence in reviewing clinical vignette 1 (elderly patient with a fall).

> tor] has doing them and how often they do them. It is the part that makes up half of our job and you look back at our training and we didn't have very much prep for it.
> I felt like it [WardSim] was really targeted at what we really care about and need to know and what most people I guess are the most frightened about …

Becoming safe clinicians

Participants reported that they desired to become safe clinicians, which motivated them to seek out learning opportunities for informing that.

> There was a transition for me when I began [as a trainee intern] switching from your grades and whatever … to 'am I safe, am I going to be safe?' If I turn up to a [resuscitation], am I going to be able to participate in it? Am I safe to practice, is what I am doing safe practice, and I think WardSim was part of that transition.

Participants described WardSim as helping to set expectations around what ward calls involve and what will be asked of them. This increased their self-confidence and clarified uncertainties.

> This is what happens, the nurse hands over, they have done the obs [observations] and it was really structured and even though it was horrifying and I also missed stuff and we all kind of felt out of our depth, I left there with this really nice feeling of there are algorithms and there are different roles and everyone will pull together … I don't think we have had that before in [the medical curriculum].

Attending ward calls

Participants reported feeling more confident to attend ward calls and said that if they had not had the WardSim training they would feel more hesitant to respond to a ward call.

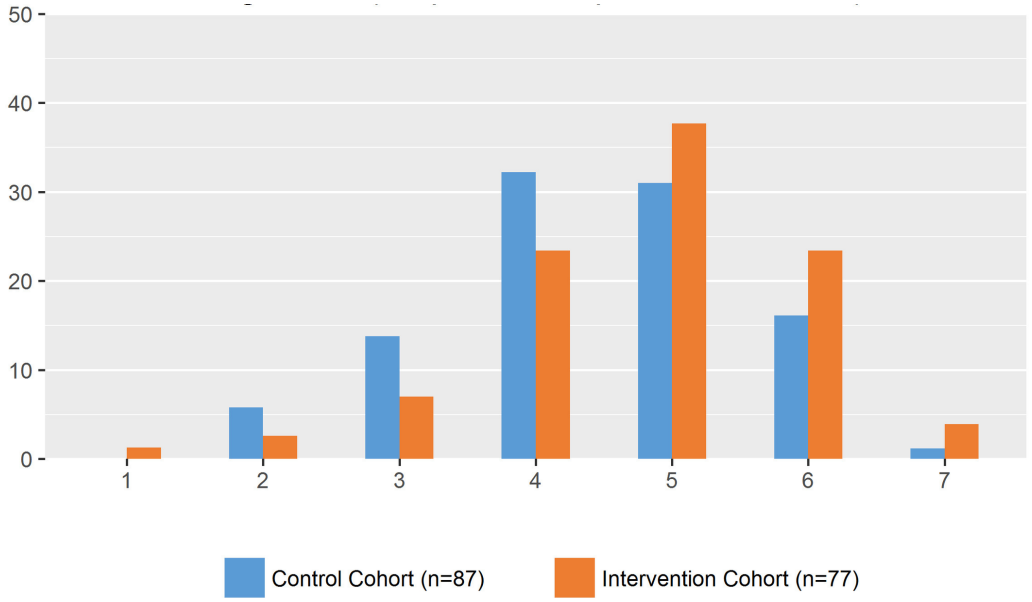

Figure 5 Level of confidence in reviewing clinical vignette 2 (suspected deep vein thrombosis).

Attending WardSim encouraged participants to attend more ward calls.

> Well like prior [to attending WardSim] I hadn't really thought about going out of my way to try and spend time with the call house officers but like having the experience and recognising the significance of being a house officer attending ward calls, it made me think 'okay, actually I really want to get a bit more comfortable with this,' and made me a bit more proactive about trying to attend more call sessions with my house officer.
> Interviewer: 'And have you actually done that?'
> 'Yeah, yeah, I have definitely' [other participants agreeing].

Experiential learning through WardSim

Observer versus active participant (opportunities to practise)

Participants reported that they found WardSim offered them valuable opportunities for experiential learning. They noted that their position change from *observer* in previous learning environments to *active participant* in WardSim gave them important opportunities to practise—to gather and synthesise information, and to make clinical decisions under some stress—in a realistic environment. These comments were almost solely in relation to their experience of the simulated scenarios (rather than the learning activities between simulated scenarios). The simulation scenarios offered participants powerful and memorable learning opportunities.

> …I missed that he had a chest drain that had popped out and that still haunts me.
> You need to be exposed to stress and think under those conditions.

Building skills

Participants said that they had developed important skills during WardSim. The four skills that they recalled learning/developing during WardSim included leadership, recognising an unwell patient, providing a structured handover (such as ISBAR) and prioritisation.

> You are never in the situation where you are the one expected to have leadership skills but yet in six weeks' time someone is going to flick a switch and that is going to be us and so that is the only practice that you get at the leadership role.
> There is a sort of time limit so you have got to watch out for the patient's vitals.
> 'Having a framework for approaching a ward call which you don't learn as a student…' 'You have got a series of tasks to do and which ones [do you] do first?'
> Knowing what are important questions to ask over the phone if you are getting a call, like what you need to be able to know to be able to prioritise.

Calling for help

Participants described learning about how and when to call for help.

> I think it also helped me be more confident in asking for help in recognising an unwell patient. In the simulator they are quite realistic and being able to manage them in the short time whilst help is coming.
> Asking for help and knowing how to ask for help, I think that was really important.

Feeling safe and supported to practise with 'that safety net'

Participants said learning opportunities during WardSim were offered in a safe and supportive environment, which contributed to their learning. Participants appreciated having had an opportunity to practise.

> But that's where you have the algorithms, so I feel more safe.
> A safe environment, that is the key [prior] to actually going out and doing it, oh there is a chest drain, thank god it is a dummy!
> …while you have still got that safety net.

Value of the interprofessional team

Participants reported that they had not experienced many opportunities to learn about patient management in interprofessional teams. They found WardSim provided them with useful information about the roles and skills of other team members, and how to work collaboratively. Participants said that as a result of WardSim they gained more respect for other professions. The collective skills of the interprofessional team were valued by participants.

> …so it was good to have them [pharmacy and nurse students], you know they have got that skill set that we don't seem to have and to be able to recognise that and utilise it in practice, because that's how it is going to be.

While a small number of participants reported that they did not see the need for pharmacist or nursing students to be involved in WardSim in order to meet their personal learning needs, most participants reported that they had learnt a lot about interprofessional team care as a result of WardSim and said that interprofessional student learning should continue to be an element of WardSim.

DISCUSSION

A comparison of our qualitative and quantitative findings indicates convergence on student confidence and active participation in ward calls.[13] Focus group participants indicated that the situation they were most anxious about facing when they became junior doctors was attending a ward call. They were worried that their skills and knowledge would be insufficient to meet the immediate urgent needs of their patients and that they might not be adequately prepared to practise safely. Participants reported that their experiences on WardSim alleviated those concerns because the course offered them experiential learning that they could then apply to real-life situations. They learnt how to work effectively with team members from other professions, to take on a leadership role, to make differential diagnoses under pressure and to know how to and when to seek help. Their sense of increased preparedness was maintained over the 9–16 months following the WardSim exposure.

The quantitative findings support those of the focus group findings. WardSim offered participants skills and experience to engage in ward calls. It also incentivised participants to engage in future ward calls (because they understood their future role and responsibilities as junior doctors). Participants who completed WardSim went on to attend more ward calls and were more likely to do so with less direct supervision than the control cohort. The overall findings therefore suggest that WardSim is effective in improving trainee interns' confidence in their ability to practise safely and effectively during ward calls. These findings support simulation-based learning as a mechanism to future learning—self-reinforcing and potentially amplifying knowledge, skills and attitudes.[17 18]

In 2010, Brennan and colleagues[1] found that students were anxious about transitioning to junior doctor because of the increased responsibilities—such as prescribing and being responsible for people's lives—and because they did not know when or how to ask for help. Their students were also anxious about having to manage and cope with patient death. Students in our study reported facing the same anxieties. Brennan and colleagues[1] suggest that in order to alleviate such anxieties students should be offered more 'meaningful contact' learning opportunities on wards prior to becoming junior doctors to accumulate hands-on experience. They write, 'clinical and communication skills are now learned mainly in simulated settings with actor patients, a context that presents challenges for the transfer of learning.'[1] While we agree that meaningful contact with actual patients is of utmost importance, the findings from our study suggest that the apprenticeship model in simulation training is valuable for preparing students to take on responsibility for patient care, especially in situations such as ward calls, where patients may be clinically unstable and students can rarely be active participants in care.

IPL opportunities are generally positively reported,[18–20] and our students' self-reported experiences were consistent in this regard with findings from other studies. Our results add support to the value of IPL, which should help counter the negative effects of the historical silo approach to healthcare education discussed by Bleakley and colleagues.[21] By educating interprofessional student groups about their own and their colleagues' roles and responsibilities, and modelling effective communication strategies, programmes such as WardSim may help promote optimal patient care by healthcare teams.

In terms of apprenticeship, the findings suggest that WardSim provides a strong avenue for students to develop their apprenticeship skills. Components of WardSim— the learning activities, scenarios and debriefs—work in concert to develop student apprenticeship in the four key areas outlined by Sheehan *et al*.[5] First, student engagement in learning and their enculturation into interprofessional team care is supported by the multiprofessional nature of the scenarios.[22] This engagement echoes Vygotsky's zone of proximal development,[23] where preparation and confidence to act at the edge of their comfort zone facilitates the student's entry into the 'community of practice'. Second, managing uncertainty in decision-making is supported through the learning activities (such as prioritisation tasks) as well as the scenarios. Third, learning from practice and maximising feedback are supported through the scenarios and debrief sessions. Fourth, key learning points covered in the debriefs demonstrate and reinforce an ethical and moral commitment to patient safety.[5]

Limitations of the study

Our response rates to the questionnaire were reasonably low (87/194 (45%) for the control cohort and 77/197 (39%) for the intervention cohort). Students in Year Six have busy schedules and our response rates may be a reflection of this. These self-reported data reflect participants' perceptions, rather than their abilities. Our study is limited to a single university in New Zealand, so our findings may not apply to other institutions or countries. Responder bias with respect to enthusiasm about WardSim cannot be excluded. The three focus groups were conducted by the first author who had no conflicts of interest, and one of the focus groups was cofacilitated by the third author who was involved in the development of WardSim. The facilitators may have introduced bias through their framing of questions. Respondents may have wished to please the facilitators and provide more positive responses. On the other hand, to limit such biases the facilitators closely followed a semistructured focus group question guide and the coding of the qualitative data was checked by several researchers. We compared data from the three focus groups and did not identify any patterns to suggest that interviewer bias informed participant responses.

All authors were involved in the development and/or facilitation of WardSim, which we see as a strength of this study since we have experiential knowledge of the course dimensions as well as the broader curriculum context in which it sits. GG, JT and JW developed WardSim. TJ, TWY, GG, JT, KB and JW had taught on WardSim at the time of data collection. We reduced opportunity for researcher bias in these ways: deidentification of data prior to analysis; the primary data analyst (TJ) was not a teacher on WardSim in 2014, so did not contribute to the course (or the participants' experiences) under evaluation; and the team met many times to check/discuss data analysis and ensure that the emergent themes/statistics were correct.

CONCLUSIONS

This simulation-based interprofessional course to prepare students for ward calls aligns well with apprenticeship models of learning. The course was valued by medical students, who considered it good preparation for the clinical management of patients and for working with other professional groups. WardSim increased trainee interns' perception of their preparedness to attend ward calls and thereby increased their confidence to attend and actively engage in ward calls. This meant they attended more ward calls than people in the control group in the year following their engagement in WardSim. They also took more active roles in ward calls than students in the control group.

Practice points

Interprofessional simulation-based ward call training can increase students' sense of preparedness to attend ward calls. Participation in interprofessional simulation-based ward call training led to students actively seeking future opportunities to attend more ward calls.

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Contributors All authors were involved at various stages in the design of the study. GG, JT and JW developed the intervention and designed the study. GG, JT, JW, AFM, WB and KB contributed to the establishment of WardSim. TJ and GG facilitated the focus groups and TWY administered the survey. TJ and TWY led the qualitative analysis and TWY led the quantitative analysis. TJ, TWY, JW and GG contributed to the first draft of the manuscript. All authors contributed to manuscript revisions and read and approved the final manuscript.

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Competing interests None declared.

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Provenance and peer review Not commissioned; externally peer reviewed.

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